

3596.02-2

3

PATENT

REMARKS

The request filed on December 15, 2000 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/228,821 is acceptable and a CPA has been established. An action on the CPA follows.

Applicant has amended the claims BASED ON THE PRELIMINARY AMENDMENT B FILED BY TELEFAX ON January 25, 2001 to better explain and define the present invention. Specifically, water is added to the claim. By definition water is present in this microemulsion. Water is present by direct addition, by being present in small amounts in some of the organic components present or added, or is available in sufficient quantities to form the microemulsion from the ambient atmosphere and/or equipment. The support for the water is found throughout the specification and claims.

No new matter has been added to the application.

REJECTION OF CLAIMS 1, 58, 61, 64, 65 68, 69, 75 AND 76UNDER 35 U.S.C. 102(e) OR 35 U.S.C. 103(a)

Claims 1, 59, 61, 64, 65, 68, 69, 75 and 76 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Steinmann U.S. Patent 6,017,368.

The Examiner states that:

"Steinmann, U.S. Patent 6,017,368, teaches low viscosity, stable W/O microemulsion fuels made from mixing diesel oil or fuel oil with additives (column 4, lines 16-20). The microemulsion fuel composition comprises: about 50 to 90% diesel oil or fuel oil, an anionic surfactant prepared from the partial neutralization of 60 to 70 mole percent of unsaturated fatty acid with ammonia such that there results both free fatty acids and the ammonium salts of the fatty acids. The ammonium salts of the fatty acids which represent the anionic surfactant comprise about 4 to 12% by weight of the microemulsion fuel. The free fatty acids comprise about 2 to 6% by weight of the microemulsion. Long chain water-insoluble or slightly soluble in water aliphatic alcohols with melting points below 0°C, for example, octanol-1, comprising 2 to 8% by weight of the microemulsion. Water-soluble aliphatic alcohols such as methanol and ethanol comprising about 5 to 14% of the microemulsion fuel. Total water in the microemulsion comprising about 1 to 10% of the microemulsion fuel. Urea Nox scavenger comprising about 0.1 to 4.0% by weight of the microemulsion fuel. Column 5, lines 21-65. Examples of some water-insoluble aliphatic alcohols besides octanol-1 are

3596.02-2

4

PATENT

amyl alcohol, hexanol-1, octanol-1, 2-ethylhexanol-1, nonanol-2 and nonanol-3 (column 7, lines 26-30). When ethanol is used it is preferred to use 95% ethanol which is more economical and practical to use compared to 100% ethanol since microemulsions already contain water (column 7, lines 41-45)."

RESPONSE:

However, this summary by the Examiner of the teaching of USP 6,017,368 omits "a non-ethoxylated non-ionic surfactant" as a "fundamental component of this invention". Steinmann's non-ethoxylated non-ionic surfactant is "the acetylenic diol surfactant, 2,4,7,9-tetramethyl-5-decyne-4,7-diol dissolved in 2-ethylhexanol-1". See:

Column 6, lines 53-55

Column 7, lines 8-11

Column 10, lines 47-68

Experiments, 1-4, 7-12, and 14-16

Claim 1, column 18, lines 24-28

Claim 12, column 18, lines 65-68 and column 19 lines 1-2.

"As noted above, Steinmann teaches microemulsion fuel compositions which reasonable appear to be either the same as or an obvious variation of the instantly claimed compositions. Accordingly, applicant's claims if not anticipated by U.S.35 U.S.C. § 102 would be obvious under U.S.35 U.S.C. § 103."

Applicant respectfully traverses this rejection.

Applicant asserts the Steinmann teachings are substantially different from and significantly less effective than the instantly claimed compositions:

1. It is possible - and preferable - to produce clear, stable water-in-oil microemulsions without the use of non-ionic surfactants.
2. If high concentrations of added water or ambient water condensation are present, inclusion of a non-ionic surfactant may be preferred for improved stability. The optional use of low-mole ethoxylated surfactants are therefore included in the present invention, and have been shown to produce superior engine performance over acetylenic diols.
3. A formulation using the acetylenic diol surfactant, 2,4,7,9-tetramethyl-5-decyne-4,7-diol dissolved in 2-ethylhexanol-1 was proven during engine testing to require 4% more fuel for

3596.02-2

5

PATENT

the same power output and to produce 2.6% more NO_x exhaust compared to a formulation using the optional low-mole ethoxylated surfactant of the present invention, all other variables being equal.

4. A formulation of the present invention that, further, does not include the optional ethoxylated non-ionic surfactant will produce similarly superior engine performance results.

Applicant also argues that the present invention was reduced to practice prior to the filing date of June 22, 1998 of Steinmann '368.

Two of Applicant's priority applications were filed prior to the Steinmann '368 filing date. The last priority document was filed shortly after Steinmann's filing date.

A Declaration of Prior Invention under 37 C.F.R. 1.131 by the inventor, Deborah Wenzel, with supporting documents is enclosed. It includes a copy of the first priority application US Ser. No. 60/071,181, filed January 12, 1998. It includes a copy of the second priority application US Ser. No. 60/079,686 filed March 27, 2001 with some comments about specific text. A copy of an interim draft of the priority document US Ser. No. 60/093,305, filed July 17, 1998 is enclosed with some comments about specific text. It is readily apparent that Applicant's present invention is prior to Steinmann's filing date of June 22, 1998.

Therefore this rejection should be overcome.

Additionally, Steinmann '368 is distinguished from the present invention and Applicant's discussion follows:

THE PRESENT INVENTION

A summary of the present invention teaches a combustible fuel composition of diesel fuel and additive as a clear microemulsion wherein said additive comprises:

- (a) anhydrous or aqueous ethanol with or without up to 5% methanol;
 - (b) alcohols having between 3 and 5 carbon atoms, or having between 6 and 12 carbon atoms, or both;
 - (c) a fatty acid in combination with aqueous or anhydrous ammonia or urea
 - (d) optionally an ethoxylated C12-16 alcohol having less than 5 moles of ethylene oxide;
- wherein components a, b, c, and optionally d as the additive when combined with mixing with

3596.02-2

6

PATENT

diesel fuel form a clear, stable microemulsion fuel composition.

It is possible to produce an absolutely anhydrous formulation based on the claims outlined above, WHICH WOULD BE A SOLUTION RATHER THAN A MICROEMULSION. However,

1. in most cases, even when water-soluble alcohols are used in their anhydrous state, small amounts of water will be present through the use of the preferred aqueous ammonia used to neutralize the fatty acid.

2. In all cases, ambient water is naturally present in the air, in fuel distribution systems, and in fuel tanks by condensation and will be absorbed into any formulation during transport and/or storage. Therefore, all fuel compositions of the present invention will become microemulsions during practical use.

3. It is important to retain the possibility of producing the fuel composition using anhydrous ethanol, because the quantity of water which optimizes and produces the best overall fuel composition and combustion is still a range '368. For instance, a 5% aqueous ethanol blend may be found to produce optimal results in controlled laboratory conditions. However, absorption of water condensation in ambient conditions may produce a predictable 5% increase in water content of the fuel composition. In that case, production using anhydrous blends would be preferable.

Provisional Application 60/093,305 (17 July 1998) of the present invention also discloses that when absolutely no water is present, it is possible to produce a stable solution with diesel fuel using only the following:

- a. anhydrous ethanol
- b. alcohols having 8-10 carbon atoms

This fuel composition will remain stable and produce exceptionally clean combustion in a diesel engine in controlled laboratory conditions.

However, because of the natural tendency for ethanol to absorb ambient water condensation - which would be unavoidable in any practical application - the additive portion of the fuel composition must be formulated to accommodate at least a small percentage of water.

When water content is very low, an effective, stable microemulsion fuel composition can be produced using diesel fuel and only the following:

- a. aqueous or anhydrous ethanol,
- b. alcohols having 3-5 carbon atoms
- c. fatty acids neutralized with ammonia and/or urea,

Applicant asserts that this minimally-produced additive formulation is an important improvement over prior art because it incorporates all of the essential components that lead to

3596.02-2

7

PATENT

improved combustion of diesel fuel:

1. water (added or ambient condensation) for optimal combustion temperature,
2. ethanol for oxygen content and more complete combustion,
3. iso-propanol for improved stability (formulations with only ethanol and neutralized fatty acid did not remain stable over time),
4. neutralized fatty acid as the primary surfactant forming the microemulsion; and does not include components that are prohibitively expensive, impede combustion, increase fuel consumption, or increase exhaust pollution, such as acetylenic diols as taught by Steinmann USP'368 or high-mole ethoxylates as taught by Wenzel et al USP '698.

As water content increases and/or other practical use factors such as optimal cetane, flashpoint, or vapor pressure are considered, middle alcohols C6-12 and most preferably C8-10 or 2ethyl hexanol, are judiciously added to meet these specifications.

Alcohols having 8-10 carbon atoms have been shown to be especially effective in enhancing microemulsion stability, reducing evaporation rate, and improving power output of the fuel composition.

In applications where it is important that the fuel composition be able to absorb high quantities of water (such as fuel tanks with water bottom), Component d. a low-mole ethoxylated 12-16 carbon alcohol is optionally available to produce this effect.

It is important, however, that the ethylene oxide level remain as low as possible because glycol - while not an actual flame retardant - does not burn well. High ethoxylate levels produce very significant increases in particulate emissions. Therefore, its use will probably be limited to short-term applications where excessive ambient water condensation is eliminated, and 'lighter' versions of the fuel composition can then be effectively applied.

Characteristics of the present invention which produce superior improvements over Steinmann USP 6,017,368 include:

a) The formulations do not include acetylenic diols:

Acetylenic diols were shown to require 4% more fuel for the same power output and to produce 2.6% more NOx exhaust compared to a formulation that was identical except that the diol was replaced with a low-mole ethoxylate.

Acetylenic diols - and specifically the surfactant, 2,4,7,9-tetramethyl-5-decyne-4,7-diol dissolved in 2-ethylhexanol-1 commercially sold as Surfynol 104A - are extremely expensive (more than \$15.00 per gallon). Generally used as a surfactant in the production of printing inks, the high cost is mitigated by the small quantity needed for printing processes. However, in compositions designed for bulk use as fuel, the cost is extremely economically prohibitive.

3596.02-2

8

PATENT

b) The formulations do not include components that form sodium salts of the fatty acids, such as sodium bicarbonate or sodium carbonate:

Bicarbonate of soda is a well-known household flame retardant, especially useful in dousing oil-based fires. A formulation including a "stoichiometric amount" of sodium bicarbonate caused the engine used for testing to chatter very badly.

Compared to a control blend (identical except for the inclusion of the sodium bicarbonate), the blend with sodium bicarbonate increased fuel consumption by 3.5% and increased nitrogen oxide emissions by 6.8%.

c) The formulations do not include ethyl carbamate:

Applicant performed small-scale lab experiments using diethyl oxalate in which the introduction of this compound produced immediate phase separation of the total fuel composition and in which no increased amount of surfactant rectified the problem of phase separation.

Because of the similarity in structure of ethyl carbamate to diethyl oxalate, and the complete failure of any of the additive components to even partially absorb the diethyl oxalate into the fuel composition, it is expected that ethyl carbamate will produce similar results.

References in Steinmann USP '368 support this assertion:

Steinmann '368 teaches that formulations including ethyl carbamate are stable at below-freezing temperatures, however ethyl carbamate must be "added after the neutralization reaction to assure that none of it hydrolyzes" (column 11 lines 43-45). These formulations were placed in a freezer at -15°C and found to be more hazy than the diesel oil control."

Steinmann '368 also teaches that higher water content (50% aqueous ethanol/methanol) "may enhance the low temperature stability because of better solubility of ... ethyl carbamate at the higher water content." Column 17 line 43-45. These results indicate that ethyl carbamate seriously compromises microemulsion stability, requiring extremely high concentrations of water, which in turn require the use of the acetylenic diol, which formulation will produce substantially inferior engine performance results.

BACKGROUND INFORMATION CONCERNING STEINMANN '368

This recently issued Steinmann U.S. Patent '368 is an unexpected and unwelcome surprise.

Applicant believes that most of the chemicals, equipment, test procedures, related fees, travel expenses, and legal fees associated with the exploration of the ideas expressed in Steinmann '368 patent were paid for by SAgA Fuel Systems, Inc. (formerly MeFA, LLC).

The existence of the Steinmann patent was not known to the inventor of the present

3596.02-2

9

PATENT

invention until Friday, 16 February 2001, when a potential licensee of the pending formulations informed SAgA, Inc. that the Steinmann patent '368 had surfaced through an Internet search of microemulsion technology.

The undersigned Attorney of Record Howard Peters was informed in writing the following day, 17 February 2001, when the process of preparing a disclosure to the US Examiner was initiated, to be completed when Dr. Peters returned from travel out of state. On 28 February 2001, a phone call by the undersigned attorney of record to the USPTO Examiner J. Johnson clarified that an action had already been completed and mailed, and the docketed response from the Examiner, which references the Steinmann patent '368, was obtained.

About June 1997, the present inventor began a series of independent experiments, with the continued support of the company's financial investors.

About July 1997, a significant discovery was made: an improvement over both the expired Wenzel et al. US Patent 4,083,698 and the position H.W. Steinmann had maintained, which is now documented in Steinmann US Patent 6,017,368.

REJECTIONS OF CLAIMS 62, 63, 66, 67 and 70 UNDER 35 U.S.C. 103(a)

Claims 62, 63, 66, 67 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Steinmann '368.

The Examiner states that:

"Steinmann, U.S. Patent 6,017,368, teaches low viscosity, stable W/O microemulsion fuels made from mixing diesel oil or fuel oil with additives, but differs from the instant claims in not specifically disclosing the claimed ratio of additives. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to follow the teachings of Steinmann and arrive at a composition having the claimed ratio of additives because those composition are encompassed by the teachings of Steinmann."

Applicant respectfully traverses this rejection.

Applicant incorporates the arguments above for Steinmann '368 at this point.

Applicant incorporates the Declaration of Prior Invention under 37 CFR 1.131.

Applicant also includes a Declaration of the Inventor Pursuant to 37 CFR 1.132 which delineates further that the present invention is distinguished from Steinmann '368.

Based on these arguments and Declarations, Applicant argues that this rejection has been overcome and should be withdrawn

REJECTIONS OF CLAIMS 1, 59, 60, 62-64, 66-68, 70-71 AND
73-76 UNDER 35 U.S.C. 103(a)

3596.02-2

10

PATENT

Claims 1, 59, 60-64, 66-68, 70, 71 and 73-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wenzel et al. (U.S. Patent 4,083,698)

The Examiner states that:

"Wenzel et al. U.S. Patent 4,083,698, teach liquid fuel compositions comprising a mixture of hydrocarbons, such as gasoline, diesel fuel, or fuel oil; water, preferable a water-soluble alcohol; and a combination of surface-active agents (column 1, lines 19-24). The fuel composition has a viscosity similar to that of a hydrocarbon fuel itself (column 2, lines 63-65). The combination of surface-active agents comprises (1) a long-chain fatty acid salt, or, more preferably an ammonium or sodium long-chain fatty acid salt, or mixtures thereof; (2) a free unsaturated long-chain fatty acid; and (3) a non-ionic surfactant typified by ethylene oxide condensation products and esterification products of a fatty acid with ethylene oxide (column 3, lines 30-38). Although oleic acids is most preferred, both as the free acid, and in combination with the ammonium and sodium hydroxide to form the salts, other unsaturated acids having from about 12-18 carbon atoms, such as linoleic may be used as well as mixtures of these acids. Also, saturated long-chain fatty acids having from about 12-18, such as stearic palmitic, myristic or lauric acids or mixtures thereof, may be used in combination with greater amounts of unsaturated acids (column 3, lines 49-52). The ethylene oxide condensation products which may be used include fatty alcohols having 12 to 18 carbon atoms (column 4, lines 7-38). Although methanol is preferred, the other water-soluble alcohols, such as ethanol, isopropanol, and mixtures of these, can be used (column 5, lines 54-56). While the amount of surface active-agents required must depend on the amounts of water and alcohol used in the fuel compositions, it is generally preferred that the ratio of the condensation products to the ammonium and/or mixture of ammonium and sodium salts of the saturated or unsaturated long-chain fatty acids be in the range of 1:2 to 3:1 by weight (column 5, line 66 to column 6, line 4). The alcohol can be added as a solution in water or it can be added separately (column 8, lines 10-13). Column 17, lines 15-19, teach that the addition of either ethanol or isopropanol stabilized emulsions at -24°C and that water or methanol could be added by neither one of those stabilized the emulsion unless ethanol or isopropanol was also added.

While Wenzel et al. differ from the instant claims in not requiring the presence of both ethanol and a straight or branched chain alcohol having between 3 and 5 carbon atoms, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include both ethanol and isopropanol in a fuel composition as taught by Wenzel et al because Wenzel et al specifically teach that mixtures of alcohols may be used."

Applicant respectfully traverses this rejection.

The essential elements of the Wenzel et al. patent are: liquid fuel compositions comprising gasoline, diesel fuel, or fuel oil and:

- a. water (0.1-10% by weight of total fuel)
- b. a water-soluble alcohol (C1, C2, C3)
- c. an ammonium or sodium fatty acid salt, or combinations thereof
- d. a free unsaturated long-chain fatty acid (oleic or linoleic)
- e. a non-ionic surfactant as an ethoxylated fatty alcohol (EO mole value: 5-20)

3596.02-2

11

PATENT

The significant difference between these formulation and those outlined in the present invention is the discovery that a stable microemulsion can be produced without the aid of a non-ionic surfactant:

The Wenzel et al. reference is cited and overcome in Applicant's equivalent PCT application as U.S. Patent No. 4,083,698.

The first and most apparent problem concerning the Wenzel et al. patent especially as it relates to diesel fuel/other distillate fuels is its lack of lower alcohols C4-C5, and especially its lack of middle alcohols C6-12.

Without the presence of these alcohols, especially the C8 alcohols, the invention relies entirely on ethoxylated alcohols and neutralized fatty acids for its surfactant portion, necessitating a high concentration of both in order to produce a stable total fuel composition.

A fuel composition with too high a concentration of neutralized fatty acids leaves an unacceptable residue in fuel system and internal engine parts.

A fuel composition with too high a concentration of ethoxylated alcohols will adversely affect combustion because ethylene oxides do not burn well. A high enough concentration of ethylene oxide actually increases exhaust smoke, which conflicts directly with the objective of the invention to reduce pollution.

Also, both neutralized fatty acids and ethoxylated alcohols are extremely viscous compared to the viscosity of fossil fuels. Too high a concentration of either or both will adversely affect the viscosity of the total additive composition, which must match as nearly as possible the viscosity of the original fuel in order to be useful in existing fuel systems and engines.

The presence of lower alcohols (C4-5) and middle alcohols (C6-12) and most especially middle alcohols (the C8 alcohols) in the present invention make it possible to greatly reduce the proportion of neutralized fatty acids needed to produce a stable fuel composition and to even further reduce or eliminate the need for ethoxylated alcohols.

The second problem of the Wenzel et al. patent is its specified range of ethoxylated alcohols as having between 5 and 20 moles ethylene oxide. Besides the high quantity of ethoxylated alcohols required, the dense quality of the ethoxylates specified further guarantees a total additive composition that will not produce optimum combustion and is too viscous for optimum use in existing fuel systems and engines.

It is also important, as outlined in the present invention, that very low levels of ethylene oxide (3 EO moles (units) or less) are optionally available for the purpose of enhancing stability in the presence of high water concentration.

Finally, without the inclusion of middle (C6-12) alcohols, which have been shown to

3596.02-2

12

PATENT

greatly reduce evaporation levels of lower alcohols (C1-2), while ethoxylated alcohols and neutralized fatty acids did not reduce evaporation levels, a defect of the Wenzel et al patent is that additive compositions of this invention will produce unacceptable levels of methanol/ethanol vapors.

The Examiner's attention is directed to the Declaration of the Inventor under 37 CFR 1.132 which is incorporated herein by reference.

Based on these arguments and the Declaration, Applicant argues that this reaction is overcome and request that it be reconsidered and withdrawn.

REJECTIONS OF CLAIMS 1 AND 59-77 UNDER 35 U.S.C. 112

Claims 1 and 59-77 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner states that:

"Claims 1 and 59-77 are directed to a composition which comprises diesel fuel and an additive. Claims 1 and 59-77 recite that "the additive when combined with mixing with diesel fuel form a clear, stable microemulsion fuel composition", yet the claims do not appear to require the presence of water.

Claim 77 lacks antecedent basis for the specifically recited fatty acids, i.e., claim 1, from which claim 77 depends, defines the fatty acids as having the structure R - (C=O)-OH, wherein R is alkyl having between about 10 to 24 carbon atoms. Fatty acids wherein R is alkyl do not include the unsaturated acids of claim 77."

Applicant respectfully traverses this rejection.

Claim 1 has been amended to include water and R to include alkylene.

Water - by definition - must be present or a clear microemulsion is not obtained. The water can be added directly, be present in aqueous ethanol, be present as aqueous ammonia, be present as true quantities in other reagents, or absorbed in sufficient quantities from the ambient environment.

Therefore this rejection has been overcome.

Reconsideration and withdrawal is respectfully requested.

COMMENT

The citation of U.S. Patent 4,406,519 to Shaw entitled "PROJECTION SCREEN ASSEMBLY", is not pertinent to the claimed invention and has not been made of record. Additionally, the information disclosure statement fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood

3596.02-2

13

PATENT

by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in English language. Accordingly, German 2511249, France 2453210 and 2493863 have not been considered.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

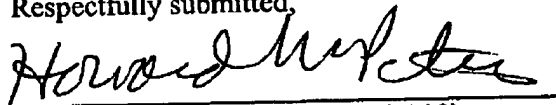
SUMMARY

Based on the above arguments and amendments, Applicant argue that these claims are now of a form and allowance. A prompt notification thereof is respectfully requested.

IF THE EXAMINER HAS ANY QUESTIONS, PLEASE CALL THE UNDERSIGNED AT 650-324-1677 X 20 AS SOON AS POSSIBLE.

The Examiner is authorized to charge or credit PTO Deposit Account No. 16-1331 for any needed expense in the filing of this response.

Respectfully submitted,



Date: March 22, 2001

Howard M. Peters (Reg. No. 29,202)
Attorney of Record
PETERS, VERY, JONES & BIKŠA, LLP
385 Sherman Avenue, Suite 6
Palo Alto, CA 94306-1840
Telephone no. (650) 324-1677
Facsimile no. (650) 324-1678
Attorney Docket No. 3596.02-2

Enclosures:

- Declaration under 37 C.F.R. 1.131-to be hand delivered
- Declaration under 37 C.F.R. 1.132- to be hand delivered
- Clean Claim

f:\hmp\3596.02-2\Amend.Draft5.wpd